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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/628,380 | 07/29/2003 | Dong Han Seo | LT-0037 | 4334 |

34610 7590 07/03/2006

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| EXAMINER | |
|---|---|
| TRAN, CON P | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2615 | |

DATE MAILED: 07/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/628,380 | SEO ET AL. | |
| | Examiner | Art Unit | |
| | Con P. Tran | 2615 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *29 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *07/11/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Priority*

1. Acknowledgment is made of Applicants' claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Applications:

Korea No. 02-46332, filed on August 6, 2002

Korea No. 02-46897, filed on August 8, 2002

Korea No. 02-47335, filed on August 10, 2002

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. **Claims 1, 5, 19-21, and 24** are rejected under 35 U.S.C. 102(e) as being anticipated by O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737").

Regarding **claim 1**, O'Brien' 737 teaches a multi-channel PWM (Pulse Width Modulator) apparatus (see col. 3, line 63 – col. 4, line 9; see Figs. 1, 7, and respective portions of the specification), comprising:

a plurality of pulse width modulation means (PWM 119, Figs. 1, 7) for modulating audio signals (112, 70, 71, Figs. 1, 7) into PWM-based multi-channel audio signals (outputs of PWMs; col. 3, lines 8-15; col. 5, lines 39-48); and

and a plurality of phase shifting means (delay timing control 120, Fig. 1) for phase-shifting modulated output signals received from the pulse width modulation means (col. 3, lines 16-22).

O'Brien' 737 thus discloses all the claimed limitations.

Regarding **claim 5**, O'Brien' 737 teaches a multi-channel PWM (Pulse Width Modulator) apparatus (see col. 3, line 63 – col. 4, line 9; see Figs. 1, 7, and respective portions of the specification), comprising:

a plurality of pulse width modulation means (PWM 119, Figs. 1, 7) for modulating audio signals (112, 70, 71, Figs. 1, 7) into PWM-based multi-channel audio signals (outputs of PWMs; col. 3, lines 8-15; col. 5, lines 39-48); and

gain control means (volume control 114, Fig. 1) for receiving the audio signals received at the plurality of pulse width modulation means, wherein the gain control means independently controls gains of the received audio signals according to individual channels (col. 2, lines 8-39).

O'Brien' 737 thus discloses all the claimed limitations.

Regarding **claim 19**, O'Brien' 737 teaches a multi-channel PWM (Pulse Width Modulator) apparatus (see col. 3, line 63 – col. 4, line 9; see Figs. 1, 7, and respective portions of the specification), comprising:

a plurality of pulse width modulators (PWM 119, Figs. 1, 7) configured to modulate audio signals (112, 70, 71, Figs. 1, 7) into PWM-based multi-channel audio signals (outputs of PWMs; col. 3, lines 8-15; col. 5, lines 39-48); and

a plurality of signal controlling means (via volume control 114, Fig. 1) coupled to the plurality of modulators for controlling at least one of input signals and output signals of the plurality of pulse width modulators (col. 2, lines 8-39).

O'Brien' 737 thus discloses all the claimed limitations.

Regarding **claim 20**, O'Brien' 737 further teaches wherein the plurality of signal controlling means comprise a plurality of phase shifting means for phase-shifting modulated output signals received from the pulse width modulation means (delay timing control 120 for each PWM 119, Figs. 1, 7; col. 3, lines 16-22).

Regarding **claim 21**, O'Brien' 737 further teaches wherein the plurality of signal controlling means comprise a plurality of gain control means (via volume control 114, Fig. 1) for receiving the audio signals received at the plurality of pulse width modulation means, wherein the gain control means independently controls gains of the received audio signals according to individual channels (col. 2, lines 8-39).

Regarding **claim 24,** this claim has similar limitations as Claim 21. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 21.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 2-4** are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Grosso et al. U.S. Patent 6,473,009 (hereinafter, "Grosso"), and further in view of McPherson et al U.S. Patent 6,567,359 (hereinafter, "McPherson").

Regarding **claim 2**, O'Brien' 737 teaches the apparatus as set forth in claim 1. O'Brien' 737 further discloses pulse width modulation of eight channels (col. 5, lines 1-15). However, O'Brien' 737 does not explicitly disclose wherein the pulse width modulation means includes pulse width modulators for PWM-modulating PCM-based channel audio signals.

Grosso discloses a PWM power amplifier is provided that has at least one PCM/PWM converter that is fed with PCM digital input signals and produces PWM

digital output signals (four PCM/PWM converters 2, 3, 20, 30; Fig. 11; col. 1, lines 59-65; col. 5, lines 55-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a PCM/PWM converter of Grosso teaching with an apparatus of O'Brien' 737 such that wherein the pulse width modulation means includes a plurality of pulse width modulators for PWM-modulating PCM-based a plurality of pulse channel audio signals as claimed for purpose of being less effected by noise, as suggested by Grosso in column 2, lines 14-15.

However, O'Brien' 737 in view of Grosso does not explicitly disclose six pulse width modulators for PWM-modulating PCM-based six-channel audio signals read from an optical disc while being classified according to individual channels.

McPherson discloses DVD-like recording and playback media in which six channels of high-quality audio (encoded, e.g., in a linear PCM or .DELTA..SIGMA. modulation format) may be used (see Figs. 3, 4; col. 2, lines 33-43).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated six-channels PCM of McPherson teaching with an apparatus of O'Brien' 737 in view of Grosso so that wherein the pulse width modulation means includes six pulse width modulators for PWM-modulating PCM-based six-channel audio signals read from an optical disc while being classified according to individual channels as claimed for purpose of providing multiple two-channel encoding options, as suggested by McPherson in column 2, lines 9-10.

Regarding **claim 3**, O'Brien' 737, as modified, further teaches wherein the phase shifting means includes more than three phase shifters for phase-shifting individual output signals of the six pulse width modulators (delay timing control 120 for each PWM 119, Figs. 1, 7).

Regarding **claim 4**, O'Brien' 737, as modified, further teaches wherein the phase shifters phase-shift selected output signals having adjacent hardware signal processing paths in the individual output signals of the six pulse width modulators, such that there is no time at which rising and falling edges of the adjacent phase-shifted output signals simultaneously occur (phase offset between each wave is one-sixteenth of a cycle; see Fig. 2; col. 5, lines 1-15).

6. **Claims 6-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Ahn U.S. Patent 5,940,021, and further in view of O'Brien U.S. Patent 6,107,876 (hereinafter, "O'Brien' 876").

Regarding **claim 6**, O'Brien' 737 teaches the apparatus as set forth in claim 5. O'Brien' 737 further discloses a plurality of gain controllers (volume control 114, Figs. 1, 7) that each vary levels of respective audio signals received at the pulse width modulation means (col. 2, lines 8-39); comparing ramp signal value with the input data

to produce the pulse stream (col. 3, lines 8-15); adding signals at speakers (col. 5, line 60 – col. 6, line 5); amplifying signals (col. 5, lines 15-23).

However, O'Brien' 737 does not explicitly disclose a plurality of gain controllers that each vary levels of respective audio signals received at the pulse width modulation means; a plurality of comparators that compare levels of audio signals generated from the gain controllers with a reference level; AGC (Automatic Gain Control means for variably controlling the gain controllers according to individual output signals of the comparators.

Ahn discloses an apparatus for measuring a characteristic pulse width for a data channel comprising a first comparator (60, Figs. 7, 11) comparing rectifier output with a reference signal (col. 12, lines 7-15); controlling the amplification gain of AGC amplifier (11, Figs. 7,11) in accordance with the average value of the rectified signal from rectifier (30, Figs. 7,11), to maintain the output signal from AGC amplifier (11) at a constant amplitude (col. 9, lines 37-41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated comparator and AGC amplifier of Ahn teaching with the apparatus of O'Brien' 737 to obtain a plurality of comparators that compare levels of audio signals generated from the gain controllers with a reference level; AGC (Automatic Gain Control) means for variably controlling the gain controllers according to individual output signals of the comparators as claimed for purpose of directly measuring a characteristic pulse width for a data channel, as suggested by Ahn in column 4, lines 38-41.

However, O'Brien' 737 in view of Ahn does not explicitly disclose a plurality of adders that perform addition or subtraction between a control signal generated from the AGC means and volume control signals for each channel, and independently varying gains for said each channel.

O'Brien' 876 discloses adder/delay element circuit (27, Fig. 3) of noise shaper (Fig. 3A) to provide signal to the PWM (see Fig. 1; col. 5, lines 13-29; col. 7, lines 31-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated adders of O'Brien' 876 teaching with the apparatus of O'Brien' 737 in view of Ahn so that a plurality of adders that perform addition or subtraction between a control signal generated from the AGC means and volume control signals for each channel, and independently varying gains for said each channel as claimed for purpose of providing optimum cost-to-performance ratios, as suggested by O'Brien' 876 in column 4, lines 38-41.

Regarding **claim 7**, O'Brien' 737 in view of Ahn, and further in view of O'Brien' 876 teaches the apparatus as set forth in claim 6.

However, O'Brien' 737, Ahn, O'Brien' 876 in combination does not explicitly disclose wherein the number of the gain controllers, the comparators, or the adders is identical with a number of channels of the pulse width modulation means.

Since each channel including separated pulse width modulator, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

have included the same the number of the gain controllers, the comparators, or the adders with a number of channels of the pulse width modulation means for purpose of reducing or eliminating noise that is generated from one channel does not leak into (or is not induced into) another channel, as suggested by O'Brien' 737 in column 3, lines 63-67).

7. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Ahn U.S. Patent 5,940,021, further in view of O'Brien U.S. Patent 6,107,876 (hereinafter, "O'Brien' 876"), and further in view of Stanley U.S. Patent 6,683,494.

Regarding **claim 8**, O'Brien' 737 in view of Ahn, and further in view of O'Brien' 876 teaches the apparatus as set forth in claim 7.

However, O'Brien' 737 in view of Ahn and further in view of O'Brien' 876 does not explicitly disclose wherein the plurality of pulse width modulation means receive a reference signal, and wherein the gain control means controls gains when the reference signal indicates an overload condition of the pulse width modulation.

Stanley discloses a pulse width modulated (PWM) audio power amplifier (10, Fig. 1; col. 3, lines 58-59) in which the PWM modulator (220, Fig. 4) may detect potential overload conditions based on the current overload indication provided on the current overload line (64) from the current overload limiter (52); implementing the compression/limiter functionality (col. 17, lines 25-35); lowering the thresholds of input

signals (col. 8, lines 28-34); aborting operation, requesting operator intervention (e.g., turning off; col. 9, lines 55-60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated overload detection of Stanley teaching with the apparatus of O'Brien' 737, Ahn, O'Brien' 876 in combination so that the plurality of pulse width modulation means receive a reference signal, and wherein the gain control means controls gains when the reference signal indicates an overload condition of the pulse width modulation as claimed for purpose of optimizing fidelity in demanding high fidelity audio applications, as suggested by Stanley in column 2, lines 45-48.

8. **Claims 9, 22-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Beard U.S. Patent 5,796,359.

Regarding **claim 9**, O'Brien' 737 teaches a multi-channel PWM (Pulse Width Modulator) apparatus (see col. 3, line 63 – col. 4, line 9; see Figs. 1, 7, and respective portions of the specification), comprising:

a plurality of pulse width modulation means (PWM 119, Figs. 1, 7) for modulating audio signals (112, 70, 71, Figs. 1, 7) into PWM-based multi-channel audio signals (outputs of PWMs; col. 3, lines 8-15; col. 5, lines 39-48).

However, O'Brien' 737 does not explicitly disclose control means for independently turning on/off the plurality of pulse width modulation means according to individual channels

Beard discloses a data conversion system (10, 50, Figs. 1, 2) having pulse width modulation (24) in which the control circuitry (40) selectively disables the pulse-width modulator (24, col. 2, lines 45-52; col. 5, lines 41-48; col. 6, lines 30-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a control circuitry of Beard teaching with an apparatus of O'Brien' 737 to obtain a control means for independently turning on/off the plurality of pulse width modulation means according to individual channels as claimed for purpose of providing a lower costs solution to data conversion and data processing than was otherwise available, as suggested by Beard in column 2, lines 43-45.

Regarding **claim 22**, O'Brien' 737 teaches the apparatus of claim 21.

However, O'Brien' 737 does not explicitly disclose wherein the plurality of signal controllers comprising a plurality of controllers that independently enable the plurality of pulse width modulators according to individual channels.

Beard discloses a data conversion system (10, 50, Figs. 1, 2) having pulse width modulation (24) in which the control circuitry (40) selectively disables the pulse-width modulator (24, col. 2, lines 45-52; col. 5, lines 41-48; col. 6, lines 30-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a control circuitry of Beard teaching with a

receiver of O'Brien' 737 to obtain a control means for independently turning on/off the plurality of pulse width modulation means according to individual channels as claimed for purpose of providing a lower costs solution to data conversion and data processing than was otherwise available, as suggested by Beard in column 2, lines 43-45.

Regarding **claim 23,** this claim has similar limitations as Claim 22. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 22.

Regarding **claim 25,** this claim has similar limitations as Claim 22. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 22.

Regarding **claim 26,** this claim has similar limitations as Claim 22. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 22.

9. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Beard U.S. Patent 5,796,359, and further in view of McPherson et al U.S. Patent 6,567,359 (hereinafter, "McPherson").

Regarding **claim 10**, O'Brien' 737 in view of Beard teaches the apparatus as set forth in claim 9.

However, O'Brien' 737 in view of Beard does not explicitly disclose wherein the pulse width modulation means is comprised of six pulse width modulators for PWM-modulating PCM-based six-channel audio signals read from an optical disc while being classified according to individual channels.

McPherson discloses DVD-like recording and playback media in which six channels of high-quality audio (encoded, e.g., in a linear PCM or .DELTA..SIGMA. modulation format) may be used (see Figs. 3, 4; col. 2, lines 33-43).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated six-channels PCM of McPherson teaching with an apparatus of O'Brien' 737 in view of Beard so that wherein the pulse width modulation means includes six pulse width modulators for PWM-modulating PCM-based six-channel audio signals read from an optical disc while being classified according to individual channels as claimed for purpose of providing multiple two-channel encoding options, as suggested by McPherson in column 2, lines 9-10.

10. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Beard U.S. Patent 5,796,359, further in view of McPherson et al U.S. Patent 6,567,359 (hereinafter, "McPherson"), and further in view of Sugital et al. U.S. Patent 6,538,523 (hereinafter, "Sugital").

Regarding **claim 11**, O'Brien' 737 in view of Beard further in view of McPherson teaches the apparatus as set forth in claim 9.

However, O'Brien' 737 in view of Beard further in view of McPherson does not explicitly disclose wherein the control means includes six AND gates for selectively enabling all the six pulse width modulators or a subset of pulse width modulators from among the six pulse width modulators.

Sugital discloses a multi-channel pulse width modulation (50m, Fig. 8; col. 9, lines 10-15, col. 15, lines 27-31) amplifier system (100, Fig. 1) having AND gates (64A, 64B) are connected comparator (58, Fig, 8) and selector (66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated AND gates of Sugital teaching with an apparatus of O'Brien' 737 in view of Beard further in view of McPherson so that wherein the control means includes six AND gates for selectively enabling all the six pulse width modulators or a subset of pulse width modulators from among the six pulse width modulators as claimed for purpose of preventing a decline in operational reliability, as suggested by Sugital in column 2, lines 24-26.

11. **Claim 12** is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737") in view of Beard U.S. Patent 5,796,359, further in view of McPherson et al U.S. Patent 6,567,359 (hereinafter, "McPherson"), further in view of Sugital et al. U.S. Patent 6,538,523 (hereinafter, "Sugital"), and further in view of Stanley U.S. Patent 6,683,494.

Regarding **claim 12**, O'Brien' 737, Beard, McPherson, Sugital combination teaches the apparatus as set forth in claim 11.

However, O'Brien' 737, Beard, McPherson, Sugital in combination does not explicitly disclose wherein the AND gates each receive an overload condition signal for compulsorily tuning off the pulse width modulators when a value of system load is higher than a reference value, and PWM on/off control signals for every channel for turning on/off the pulse width modulators according to a user's key signal or an optical disc type, and performing an AND operation between the overload condition signal and the PWM on/off control signals.

Stanley discloses a pulse width modulated (PWM) audio power amplifier (10, Fig. 1; col. 3, lines 58-59) in which the PWM modulator (220, Fig. 4) may detect potential overload conditions based on the current overload indication provided on the current overload line (64) from the current overload limiter (52); implementing the compression/limiter functionality (col. 17, lines 25-35); aborting operation, requesting operator intervention (e.g., turning off; col. 9, lines 55-60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated overload detection of Stanley teaching with the apparatus of O'Brien' 737, Beard, McPherson, Sugital in combination so that wherein the AND gates each receive an overload condition signal for compulsorily tuning off the pulse width modulators when a value of system load is higher than a reference value, and PWM on/off control signals for every channel for turning on/off the

pulse width modulators according to a user's key signal or an optical disc type, and performing an AND operation between the overload condition signal and the PWM on/off control signals as claimed for purpose of optimizing fidelity in demanding high fidelity audio applications, as suggested by Stanley in column 2, lines 45-48.

12. **Claims 13-15, and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. U.S. Patent 7,047 (hereinafter, "Kondo") in view of O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737").

Regarding **claim 13**, Kondo teaches an audio/visual receiver (DVD, VCR, tuner, monitor; col. 7, lines 49-56; see Figs. 18, 22, 38, and respective portions of the specification), comprising:

a reader (DVD player 96A, Fig. 38) configured to output a first data signal based on information stored in a recording medium (col. 42, lines 13-21);

a tuner (61, Fig. 18) configured to output a second data signal (col. 27, lines 34-40);

a decoder (81, Fig. 22) coupled to the reader configured to decode the data signals into audio signals (col. 31, lines 9-18);

a speaker (306, Fig. 42) configured to receive and output the PWM-based multi-channel audio signals (see col. 44, lines 45-51).

However, Kondo does not explicitly disclose a pulse width modulator device configured to modulate the audio signals into PWM-based multi-channel audio signals

that comprises, a plurality of pulse width modulators configured to modulate the audio signals into the PWM-based multi-channel audio signals; and a plurality of signal controllers coupled to the plurality of modulators to independently control at least one of input signals and output signals of the plurality of pulse width modulators.

O'Brien' 737 teaches a pulse width modulator device configured to modulate the audio signals into PWM-based multi-channel audio signals (see col. 3, line 63 – col. 4, line 9; see Figs. 1, 7, and respective portions of the specification), that comprising:

a plurality of pulse width modulation means (PWM 119, Figs. 1, 7) for modulating audio signals (112, 70, 71, Figs. 1, 7) into PWM-based multi-channel audio signals (outputs of PWMs; col. 3, lines 8-15; col. 5, lines 39-48); and

a plurality of signal controllers (via volume control 114, Fig. 1) coupled to the plurality of modulators to independently control at least one of input signals and output signals of the plurality of pulse width modulators (col. 2, lines 8-39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a pulse width modulator of O'Brien' 737 device teaching with an audio/visual receiver of Kondo to obtain a an audio/visual receiver as claimed for purpose of reducing or eliminating noise that leak from one channel to another, as suggested by O'Brien' 737 in column 4, lines 63-67.

Regarding **claim 14**, O'Brien' 737, as modified, further teaches wherein the plurality of signal controllers comprise a plurality of phase shifters that phase-shift

modulated output signals received from the pulse width modulators (delay timing control 120 for each PWM 119, Figs. 1, 7; col. 3, lines 16-22).

Regarding **claim 15**, O'Brien' 737, as modified, further teaches wherein the plurality of signal controllers comprise a plurality of gain controllers (volume control 114, Fig. 1) that receive the audio signals received at the plurality of pulse width modulators, wherein the gain controllers independently control gains of the received audio signals according to individual channels (col. 2, lines 8-39).

Regarding **claim 17,** this claim has similar limitations as Claim 15. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 15.

13. **Claims 16, 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. U.S. Patent 7,047 (hereinafter, "Kondo") in view of O'Brien U.S. Patent 6,429,737 (hereinafter, "O'Brien' 737"), and further in view of Beard U.S. Patent 5,796,359.

Regarding **claim 16**, Kondo in view of O'Brien teaches the receiver of claim 15.

However, Kondo does not explicitly disclose wherein the plurality of signal controllers comprising a plurality of controllers that independently enable the plurality of pulse width modulators according to individual channels.

Beard discloses a data conversion system (10, 50, Figs. 1, 2) having pulse width modulation (24) in which the control circuitry (40) selectively disables the pulse-width modulator (24, col. 2, lines 45-52; col. 5, lines 41-48; col. 6, lines 30-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a control circuitry of Beard teaching with a receiver of Kondo in view of O'Brien' 737 to obtain a control means for independently turning on/off the plurality of pulse width modulation means according to individual channels as claimed for purpose of providing a lower costs solution to data conversion and data processing than was otherwise available, as suggested by Beard in column 2, lines 43-45.

Regarding **claim 18,** this claim has similar limitations as Claim 16. Therefore it is interpreted and rejected for the reasons set forth in the rejection of Claim 16.

## ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Con P. Tran whose telephone number is (571) 272-7532. The examiner can normally be reached on M - F (8:30 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Vivian C. Chin can be reached on (571) 272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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June 24, 2006

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